BEFORE
THE PUBLIC SERVICE COMMISSION OF
SOUTH CAROLINA

DOCKET NO. 2018-319-E

In the Matter of:	)	
	)	**DIRECT TESTIMONY OF**
Application of Duke Energy Carolinas, LLC	)	**NILS J. DIAZ, PhD**
for Adjustments in Electric Rate Schedules and	)	**FOR DUKE ENERGY**
Tariffs	)	**CAROLINAS, LLC**

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Nils J. Diaz and my business address is 3414 West Gables Ct., Tampa, Florida, 33609.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by The ND2 Group, LLC ("ND2"), as its Managing Director. ND2 is a policy advising and consulting group with a strong focus on nuclear energy matters. ND2 presently provides expert advice for clients in the areas of nuclear power licensing and deployment, high-level radioactive waste disposal, processing and storage issues, and advanced security systems.

Q. PLEASE SUMMARIZE YOUR EDUCATION, PROFESSIONAL QUALIFICATIONS, AND OTHER INDUSTRY EXPERIENCE AND AFFILIATIONS.

A. I hold a Bachelor of Science Degree in Mechanical Engineering from the University of Villanova, Havana, and MS and PhD degrees in Nuclear Engineering Sciences from the University of Florida. I presently conduct policy advising and consulting for the U.S. government, foreign governments, and industry. I hold board memberships in private institutions and the position of Professor Emeritus of Nuclear Sciences at the University of Florida. I served as a Commissioner on Florida's Energy and Climate Commission from 2008 to 2010, recently chaired the ASME Presidential Task Force on Response to Japan Nuclear Power Plant Events, and chaired two major reviews of the Safety Culture and Quality Assurance Program for the Hanford

Waste Treatment Plant. I previously served as the Chairman of the United States Nuclear Regulatory Commission ("NRC") from 2003 to 2006 and as Commissioner from 1996 to 2006. Prior to my appointment to the NRC, I was the Director of the Innovative Nuclear Power and Propulsion Institute for the Ballistic Missile Defense Organization of the U.S. Department of Defense from 1985 to 1996. I have testified as an expert witness to the U.S. Senate and House of Representatives on multiple occasions over the last thirty years. Additional details on my background and experience are provided in my summary resume, which is attached as Exhibit NJD-1.

Q. DOES YOUR TESTIMONY INCLUDE ANY EXHIBITS?

A. Yes, I have included three exhibits:

Exhibit NJD-1 – Summary Resume of Nils J. Diaz, PhD;

Exhibit NJD-2 – Expected New Nuclear Power Plant Applications (2008); and

Exhibit NJD-3 – U.S. NRC: COL Applications Received through June 15, 2017.

Q. HAVE YOU EVER TESTIFIED BEFORE THIS COMMISSION?

A. No.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to review the reasonableness and prudence of the strategy and efforts of Duke Energy Carolinas, LLC ("DE Carolinas" or the "Company") to obtain a combined license ("COL") for the William States Lee III Nuclear Station Units 1 and 2 (the "Lee Nuclear Project").

Q. PLEASE DESCRIBE YOUR PERTINENT EXPERIENCE FOR REVIEWING DE CAROLINAS' APPROACH TO THE LICENSING OF THE LEE NUCLEAR PROJECT.

A. From my tenure as an NRC Commissioner starting in 1996, I have been evaluating licensing issues and applications submitted to the NRC, specifically issues related to the new licensing process under 10 CFR Part 52 whereby utilities are issued a COL before construction on the plant begins. I reviewed Westinghouse's Advanced Passive ("AP") safety designs, beginning with the AP600. The AP600 was the first of its kind, a standardized passive safety reactor. Its final Design Certification was issued in March 2000. I am thoroughly familiar with the Westinghouse AP1000 new nuclear plant design, reviewing Westinghouse's applications and the NRC staff safety reviews for a period of ten years, including the AP600 reviews. I was directly involved in its Design Certification process and signed its first Final Design Approval (Revision 15) in March 2006. The AP1000 Design Certification is referenced by DE Carolinas in its COL Application ("COLA"). Furthermore, I am cognizant of the 10 CFR Part 52 licensing process, as used by DE Carolinas to obtain the COL for the Lee Nuclear Project. In addition to my direct experience with the AP1000 design and NRC processes, I also participated in Florida Power & Light's ("FP&L") applications to the Florida Public Service Commission ("FPSC") to obtain necessary approvals for the development of two AP1000 reactors at FP&L's Turkey Point site ("Turkey Point Units 6 and 7"). I began working with FP&L to assemble the need determination in 2007

for the FPSC and continued contributing to FP&L's annual nuclear cost recovery proceedings until 2015. During my nine years working with FP&L, I provided expert testimony and testified before the FPSC annually, covering issues related to FP&L's licensing requirements, submittals to the NRC and other agencies, the overall environment for licensing new nuclear power plants and power upgrades, and specific issues impacting the pursuit of the COL for Turkey Point Units 6 & 7. I reviewed the reasonableness and prudency of the management strategy and activities, as well as the associated costs.

Q. HOW IS THE REMAINDER OF YOUR TESTIMONY ORGANIZED?

A. The remainder of my testimony is organized as follows:

II. THE 1990'S: STEPPING STONES TO NEW REACTOR DEVELOPMENT AND LICENSING

III. 2000-2010: CONFLUENCE OF CONTRIBUTING FACTORS TO NEW NUCLEAR POWER DEVELOPMENT

IV. ANALYSIS OF DE CAROLINAS' DECISION TO PURSUE A COL FOR LEE NUCLEAR PROJECT

V. OBSTACLES TO LICENSING THE LEE NUCLEAR PROJECT ON SCHEDULE

VI. REVIEW OF DE CAROLINAS COL AND PROJECT-RELATED DECISIONS AND COSTS

VII. CONCLUSIONS

II. THE 1990'S: STEPPING STONES TO NEW REACTOR DEVELOPMENT AND LICENSING

Q. WHAT WERE THE FACTORS THAT CONVERGED TO SLOW DOWN THE CONTINUING DEVELOPMENT OF NUCLEAR ELECTRICITY GENERATION IN THE UNITED STATES BY THE EARLY 1990S?

A. By the early 1990s, the road to new nuclear power development had been hindered by a combination of negative factors, commencing with the financial and market disruptions from the "oil embargos," the Three Mile Island accident in 1979, and the convergence of high construction costs, double digit inflation and interest rates, decreasing load demand, significant construction delays, regulatory uncertainty, and relatively poor economic performance of the operating nuclear plants.

Q. WHAT FACTORS CHANGED TO IMPROVE THE DEVELOPMENT OF NUCLEAR POWER?

A. Several factors were improving by the early 1990s, starting with an effort by the NRC to establish a more predictable and less onerous licensing process for nuclear power plants and followed by improvements in nuclear plant performance and economics, more advanced nuclear technology, and increased financial stability and sustained economic growth for the nation. The NRC produced in 1989 its first major change in new reactor licensing by promulgating the 10 CFR Part 52 Rule ("Part 52"), which was focused on decreasing financial risk and standardizing the design and construction of

nuclear power plants. The Part 52 rule was then codified in Section 185(b) of the Atomic Energy Act (AEA) by the Energy Policy Act of 1992 ("EPAC-92"). The EPAC-92 was promulgated by the United States Congress to establish a more effective framework for the development of nuclear power, anchored in standardized, safer, more reliable nuclear reactors, implementing strategies to minimize financial and regulatory risk. The resulting strategies included: 1) licensing decisions are to be finalized before major construction begins; 2) utilities would order their plants after regulatory/financial risks are mitigated by satisfactory completion of the new licensing process; 3) standardized, safer reactor designs are to be encouraged; and 4) limited site work could begin when warranted by effective project management.

Q. WHAT IS PART 52, AND HOW WAS IT SUPPOSED TO CONTRIBUTE TO REGULATORY LICENSING EFFECTIVENESS AND PREDICTABILITY?

A. Part 52 – LICENSES, CERTIFICATIONS, AND APPROVALS FOR NUCLEAR POWER PLANTS is a newer reactor licensing process that can be substituted for the licensing process specified in Part 50 – DOMESTIC LICENSING OF PRODUCTION AND UTILIZATION FACILITIES. In other words, Part 50 continues to be the main regulation for nuclear reactors, but issues specifically dealing with the licensing of new reactors can be treated under Part 52. Part 52 shifts the burden and uncertainty of NRC licensing to the front end of the development process. Part 52 is a powerful addition to nuclear power plant regulations that authorizes construction and conditional

operation after a comprehensive review, in order to resolve many of the scheduling problems and financial risks encountered with the Part 50 licensing process. On the other hand, under the old Part 50 reactor licensing, the applicant would not be issued an operating license until after the nuclear plant is constructed and certified to comply with assurance of protection of public health and safety. The most beneficial use of Part 52 is when two of its major components are used together: the Design Certification and the COL. The most important component of Part 52 is the COL because it is the only license that allows plant construction and operation. The Part 52 COL allows early resolution of safety and environmental issues before the plant is constructed. When the COL is paired with a certified design, the reactor safety issues resolved by the design certification rulemaking process are not reconsidered during the COL review and are, therefore, not subject to adjudication during the COL licensing process. Moreover, the Part 52 licensing process allows for full public participation, so that the issues associated with the design and site can be resolved before construction begins.

III. 2000-2010: CONFLUENCE OF CONTRIBUTING FACTORS TO NEW NUCLEAR POWER DEVELOPMENT

Q. WHAT WERE THE FACTORS INFLUENCING NUCLEAR POWER DEVELOPMENT FROM 2000 TO THE ENACTMENT OF THE 2005 ENERGY POLICY ACT?

A. The operating nuclear industry had turned the corner by the turn of the century, with capacity factors of about 90 percent and low production costs.

The nuclear vendors were proposing Generation III+ reactors that exhibit additional inherent safety and simplicity in construction and operation, with Westinghouse applying in 1996 for design certification of its AP600 passive safety features reactor and then introducing the upgraded AP1000 in 2002. The NRC regulatory framework was more stable and dependable, reactor licensing risk appeared to be reduced by the addition of Part 52, and overall regulatory risk was decreasing. The environmental issues were favoring nuclear power due to its environmentally benign footprint, near zero carbon emissions, and effective carbon abatement. Supplies of uranium were well established, diverse, and economical. The security issues raised by the 9/11/2001 terrorist attacks were well resolved by the NRC and the nuclear power industry. Environmental considerations and the 2005 Clean Air rules resulted in increased scrutiny and challenges to the continued dominance of coal as the primary electricity producer. Increasing dependence on natural gas was being questioned for its increasing price and especially for price volatility. The electrical industry was emphasizing diversity and reliability for new base-load capacity additions that would be strong contributors to long-term electrical and gas price stabilization. Nuclear power appeared to fit the need, and the political establishment responded with the Energy Policy Act of 2005 ("EPAC-05"), which contained a series of incentives for nuclear power development.

Q. HOW DID THE NUCLEAR POWER INDUSTRY RESPOND TO THE CONFLUENCE OF FACTORS FAVORING DEVELOPMENT?

A. The nuclear power industry responded by applying for new reactor licenses, proposing the subsequent construction / operation of many new units, and submitting the first new nuclear plant applications in three decades. Utilities began working on license applications in 2005, mostly for Part 52 licensing, with docketing at the NRC beginning in 2007. Five applications were docketed in 2007, including DE Carolinas' application for the Lee Nuclear Project. The industry accelerated planned nuclear development in 2008, with an additional nineteen units applying for COLs, as shown on Exhibit NJD-2, U.S. NRC: Expected New Nuclear Power Plant Applications (September 4, 2008). By the end of calendar year 2009, twenty companies had submitted applications for thirty-one new nuclear units. Also, most of the operating nuclear units in the country applied for twenty-year license extensions and committed to substantial power upgrade investments. It is apparent that utilities with significant nuclear power plant electrical generation experience had studied the marketplace, technology, and regulatory framework and decided that adding base-load nuclear power was in the best interest of their customers. The majority of companies considering new nuclear are in the Eastern Seaboard, where load demand projections, nuclear experience, and economics were favorable to nuclear power expansion.

Q. DID THE FAVORABLE ENERGY SCENARIO AND NUCLEAR EXPANSION CONTINUE THROUGH THE END OF THE DECADE AND BEYOND?

A. No. There were multiple emerging energy, economic, and political factors that impacted the nascent nuclear expansion. The so-called "Great Recession" started in late 2007 and technically ended in June 2009. However, its impact on the nation's economics and energy development continued. One of the major impacts of the Great Recession was the downturn of natural gas demand and prices, which later coupled with the significant increase in the availability of natural gas due to the introduction of hydraulic fracturing methods, resulting in historically cheap and less volatile natural gas prices. Natural gas prices had peaked in August 2005 at over $18 per thousand cubic feet ("Mcf"). Prices stood at $14.76 per Mcf in June 2008 and were down to $2.75 per Mcf in August 2009. Furthermore, the price has hovered in the range of $3 to $5 for the last seven years. The overall impact on the nation, especially on the electricity generation market, has been dramatic. The extreme volatility of natural gas prices had been a serious economic concern during the 2000-2010 decade, and concerns linger. However, the reality of much lower priced natural gas, often predicted to remain below $5 per Mcf for a couple of decades, became a principal force in the electricity marketplace. Also, it should be remarked that the issue of carbon regulatory uncertainty, especially the potential for carbon tax, cap and trade, and other forms of regulating CO_2 that have been under consideration for years, has affected energy cost

projections. Nuclear power has been expecting to benefit from any form of carbon regulation or taxation, but none has materialized. Moreover, the energy scenario changed in a very short period of time. With natural gas prices down and fluctuating within a reasonable range and production up about 50 percent due to advanced hydraulic fracturing, natural gas became the fuel of choice over coal. In addition, wind and solar power continued to make inroads as sustainable electrical energy choices. The need for increased national security, energy independence, and environmental stewardship contributed to the so-called "American Energy Renaissance." By 2010 and beyond, the abundance of cheap natural gas, aided by the surge of wind and solar power, was a dominant force in the electricity marketplace. New nuclear power development slowed when confronted with those issues and matters particular to nuclear power deployment, especially the long time required for licensing and construction. However, utilities with the strongest cases for nuclear power deployment continued to pursue plant licensing to ensure the option for base-load generation capacity, other than gas, was available when needed.

Q. HOW DID THE NUCLEAR POWER INDUSTRY REACT TO THE NEW ELECTRICITY MARKETPLACE EMERGING IN THE U.S.?

A. The reaction of the nuclear industry, as shown in Exhibit NJD-3, U.S. NRC: COL Applications Received through June 15, 2017, was mixed. Two primary paths were chosen by the nuclear utilities that had applied for a license to the U.S. NRC. Fourteen applicants decided to stop / suspend their license applications, and fourteen applicants continued the effort to obtain a license

and conduct those activities necessary to preserve the option to build and operate a nuclear power plant. The fourteen applicants suspending their COL applications included merchant plants, which primarily existed in uncertain and volatile electrical markets, some with COLAs referencing very complex reactor designs without Design Certifications (the European Nuclear Reactor, EPR). The fourteen applicants continuing to pursue the COL were in stable electrical marketplaces with significant, dependable loads. The first two COL recipients, Georgia Power and South Carolina Electric and Gas ("SCE&G"), started nuclear construction for two units each immediately after receiving their licenses, on 2/09/2012 and 3/30/2012, respectively, and right after the AP1000 Design Certification Amendment was issued in December 2011. Another six applicants have received a COL, with FP&L receiving the final pending COL for Turkey Point Units 6 & 7 in April 2018. A total of ten nuclear units maintain active COLs. Four nuclear units received COLs and subsequently terminated their licenses. While the V.C. Summer COLs remain active, construction has been cancelled for the two V.C. Summer AP1000 units. The strategy employed by the eight utilities (fourteen units) that pursued the COLs and the capability to construct / operate nuclear power plants within the framework established by Part 52 has been called the "value option." A COL, obtained after a long and exhaustive review process, is very valuable. Its value is based on the fact that securing a license to construct / operate a nuclear power plant enables the utility to select the time for construction that is most beneficial to consumers without incurring the large expenditures

required for construction. The value intrinsic to the COL and the project development effort, including the importance of a site licensed for large power generation, is preserved for when the marketplace and financial conditions are favorable to exercise the option.

IV. ANALYSIS OF DE CAROLINAS' DECISION TO PURSUE A COL FOR LEE NUCLEAR PROJECT

Q. WHAT WERE THE NUCLEAR MARKETPLACE CONDITIONS SPECIFICALLY FAVORING PURSUING A COL BY DE CAROLINAS?

A. At the time of DE Carolinas' application, the nuclear industry was experiencing a renewal due to a number of factors, including regulatory stability, safer and simpler reactor designs, projected increased energy demand, high cost and high variability of natural gas prices, economic incentives from EPAC-05, and a renewed focus on reducing carbon emissions. Fuel diversification was important to utilities as a risk reduction strategy, as was the long-term predictability of nuclear costs. As extensively discussed in the previous section, there were multiple factors that made nuclear power a viable and economic option to DE Carolinas when the company decided to pursue new nuclear. Foremost, the selected Part 52 licensing process decreases the risk by enabling the deferment of major investments until after issuance of a COL. In simple terms, DE Carolinas did not have to make major investments for nuclear power plant construction until they had a COL from the NRC. The Lee Nuclear Project was being developed following well-established management strategies to minimize financial risk to its customers.

Q. WHAT SPECIFIC REGULATORY FACTORS CONTRIBUTED TO THE DE CAROLINAS DECISION TO PURSUE A COL?

A. By mid-2005, the NRC had done extensive work to be able to docket applications for a COL under Part 52. The NRC-published schedule for a COL license review was forty-two months. A timeframe of forty-eight months was considered very probable. The NRC was quickly expanding its staff to support the expected new applications and most of the supporting regulatory framework had been or was being updated. The best approach to using the new Part 52 licensing process and its risk-reducing features is to reference a Standard Design Certification in a COL. This approach became available in January 2006, when the NRC's Design Certification for Westinghouse's AP1000 reactor was issued by rulemaking. The establishment of the AP1000 Design Certification provided the needed regulatory anchor to the COL, enabling the full utilization of Part 52 reactor licensing. Also, the enacted EPAC-05 included loan guarantees and production tax credits for a few new nuclear plants.

Q. WHAT INITIAL DECISIONS WERE MADE AND WHAT ACTIVITIES WERE CONDUCTED BY DE CAROLINAS REGARDING THE LICENSING OF THE LEE NUCLEAR PROJECT?

A. DE Carolinas decided to pursue the preparation of a COLA in 2005 and submitted it to the NRC on December 13, 2007. The application referenced Revision 16 of the AP1000's Design Control Document ("DCD") of 2007. DE Carolinas' COLA was found by the NRC staff to be suitable for review and

docketed on February 25, 2008. DE Carolinas established a project management organization to actively pursue the COL and to conduct those activities necessary to maintain its viability.

In order to ensure full disclosure of its activities and plans, and to address their cost recovery needs, DE Carolinas applied to the Public Service Commission of South Carolina ("PSCSC") for approval of its decision to incur pre-construction costs. The PSCSC, after its requisite extensive review of DE Carolinas' proposed licensing plan for the Lee Nuclear Project and with due consideration of the benefits to South Carolina customers, issued two orders approving pre-construction cost recovery as established in its June 9, 2008 *Order Approving Application of Duke Energy Carolinas' Decision to Incur Nuclear Generation Pre-Construction Costs* and its July 1, 2011 *Order Approving Amended Project Development Application and Settlement Agreement*. DE Carolinas was issued a COL for the construction and operation of the Lee Nuclear Project on December 19, 2016.

Q. WAS DE CAROLINAS' DECISION TO START THE COLA EARLY REASONABLE?

A. Yes. It was well known to DE Carolinas that Part 52, although the best licensing pathway available, was untested. Furthermore, long lead times have been often associated with nuclear plant licensing. Many other utilities were going to pursue COLs, and the number of COLAs under review was expected to grow quickly. These uncertainties could hamper the development of a nuclear project. Therefore, it was important to begin the licensing process

early enough to accommodate potential delays in order to exercise the license when it was most beneficial to DE Carolinas customers.

V. OBSTACLES TO LICENSING THE LEE NUCLEAR PROJECT ON SCHEDULE

Q. WHAT WAS THE EXPECTED TIMEFRAME FOR AN APPLICANT TO RECEIVE A COL WHEN DE CAROLINAS FILED ITS COLA?

A. The NRC schedule called for an estimated forty-two months from docketing to license, consistent with their schedule for the Design Certification. However, it was expected in 2007 that forty-eight months was more probable due to the large number of applications being docketed.

Q. WHAT HAS BEEN THE ACTUAL EXPERIENCE OF UTILITIES THAT HAVE OBTAINED A COL?

A. The eight utilities pursuing fourteen COLs were divided into two groups for the COLA reviews: Georgia Power (Vogtle plant) and SCE&G (Summer plant) as lead plants and all the other applicants in a subsequent group. Georgia Power and SCE&G had expressed their commitment to commence construction right after issuance of the COL and were given preferential review, as decided by the NRC Commissioners. The licenses for Summer and Vogtle were issued in four years, essentially as scheduled. The other ten COLs issued averaged 8.6 years from docketing to licensing. The Lee Nuclear Project license was issued in nine years, slightly above the average. It appears that all these utilities endured licensing delays from similar causes.

Q. WHAT WERE THE SPECIFIC ISSUES THAT IMPACTED THE TIMING FOR THE ISSUANCE OF THE LEE NUCLEAR PROJECT COL?

A. Two types of issues impacted timing of the issuance of the Lee Nuclear Project COL: Issues directly related to NRC management of the licensing review and issues related to DE Carolinas' improvements to the COLA from voluntary and quasi-voluntary actions.

The individual impact of the issues discussed is difficult to quantify; however, it is indisputable that each one of them and the aggregate resulted in the licensing process taking significantly longer than originally anticipated for the Lee Nuclear Project and other projects. The delay attributed directly to issues dependent on the NRC management of the licensing review and issues related to DE Carolinas improvements to the COLA are discussed below. It is also important to note that the NRC must devote its attention to arising safety issues for the operating nuclear plants, nuclear facilities, facilities under construction, and other licensees prior to resolving new licensing issues. NRC staff attention from 2010 to 2014 was frequently diverted from new reactor licensing to other pressing safety-related matters. For example, the attention that had to be devoted to the construction of the four AP1000 units at the Vogtle and Summer sites, as ordered by the NRC Commission, reduced the number of reviewers available for the Lee Nuclear Project licensing and resulted in delays for DE Carolinas and the other applicants.

A. Delays Related to the Yucca Mountain Licensing Review

Q. PLEASE EXPLAIN THE IMPACT OF THE YUCCA MOUNTAIN LICENSING REVIEW.

A. The Yucca Mountain licensing review took critical NRC staff away from reactor licensing issues in the areas of seismic, geology, site characterization, and environmental reviews. Since 2010, the review of the Yucca Mountain licensing application has been stopped and then restarted, with complex legal and budgeting issues complicating progress. Instabilities in the NRC's staffing assignments occurred. Specifically, environmental, geologic and seismic experts were diverted to these efforts, which lasted about four years. On October 16, 2014, the NRC issued the very important Volume 3 of the Yucca Mountain Safety Evaluation Report ("SER"), concluding that the design met applicable performance objectives for safety following permanent closure of the repository. On December 18, 2014, the staff issued Volume 4 (Administrative and Programmatic Requirements) of the SER, and on January 29, 2015, the staff issued the final parts of the review, Volume 2 (Repository Safety Before Permit Closure) and Volume 5 (Proposed Conditions and License Specifications), which completed the SER. Completion of these reports allowed for the resumption of more standard review schedules after 2014. The Staff resource instability while the Yucca Mountain SER was being prepared contributed to the delay in reactor licensing reviews.

B. Delays Related to the Waste Confidence Rule

Q. PLEASE PROVIDE MORE DETAILS ABOUT THE NRC'S WASTE CONFIDENCE RULE.

A. Between 1979 and 2010, the NRC established that spent nuclear fuel would be safely stored in a manner protecting public health and safety, the environment, and the common defense and security after the reactor's licensed life through a periodic generic determination of the issue, commonly known as the Waste Confidence Rule. The Waste Confidence Rule relied on confidence that the U.S. government will eventually establish a suitable repository for spent fuel. On December 23, 2010, the NRC published its most recently revised Waste Confidence Rule. This rule reaffirmed and amended the NRC's generic determinations regarding the environmental impacts of spent nuclear fuel storage at or away from reactor sites after the expiration of reactor operating licenses. In June 2012, the U.S. Court of Appeals for the D.C. Circuit vacated and remanded the NRC's Waste Confidence Rule. The Court held that the NRC must perform additional environmental reviews associated with the rule. The NRC suspended the issuance of new reactor licenses and license extensions that were reliant on this generic determination; however, the NRC continued the review of pending applications. Finally, the NRC issued the final Continued Storage of Spent Nuclear Fuel rule on August 26, 2014, significantly changing the considerations about the safety of continued storage of spent nuclear fuel to be independent of a national spent fuel repository. The ruling, made effective after publication in the Federal Register on September

19, 2014, effectively resolved the issues on the storage of spent fuel and ended the power reactor licensing suspension. The new Continued Storage of Spent Nuclear Fuel Rule adopts the findings from the new NRC generic environmental impact statement; it establishes that spent nuclear fuel can be safely managed in dry casks for the short-term (up to 60 years), the long-term (another 100 years), and for indefinite time frames. The new rule does not rely on the availability of a repository for the safe storage of spent fuel. The two-year suspension of licensing provided another uncertainty and delay at a time when the DE Carolinas COL review was advancing.

C. Delays Related to the Fukushima Dai-ichi Accident

Q. PLEASE PROVIDE MORE DETAIL ABOUT THE FUKUSHIMA DAI-ICHI ACCIDENT.

A. On March 11, 2011, the Great East Japan Earthquake and subsequent tsunami caused major loss of life and destruction of property in Japan. In addition, the tsunami led to a series of flooding events that disrupted the electrical power and equipment necessary to cool the reactors in three of the units in the Fukushima Dai-ichi nuclear power plant. The lack of cooling capability, not restored in time, resulted in the core meltdown and radioactivity releases from units 1, 2, and 3 of the Fukushima plant. The global nuclear sector responded immediately to this event with a reexamination of nuclear power plants protection from large external events, especially from flooding.

Q. WHAT WAS THE NRC'S RESPONSE TO THE FUKUSHIMA DAI-ICHI ACCIDENT?

A. The U.S. NRC responded immediately by assembling the Near-Term Task Force (NTTF) to complete a Review of Insights from the Fukushima Dai-Ichi Accident. The Task Force issued an insightful and far-reaching 2011 report on "Recommendations for Enhancing Reactor Safety in the 21st Century", which mostly addressed issues pertinent to operating nuclear power plants. The NRC, from the beginning of this new analysis of extreme external events, concluded that the AP1000 passive-safety reactor selected for the Lee Nuclear Project has significant and inherent safety enhancements that address many of the Fukushima-related safety issues. AP1000 reactors only required review and potential improvements in a few well-defined safety areas. The NRC has stated that "all of the current COL and design certification applicants are addressing new seismic and flooding requirements adequately in the context of updated NRC guidance."

Q. WHAT WAS THE IMPACT OF THE FUKUSHIMA DAI-ICHI ACCIDENT ON THE LEE NUCLEAR PROJECT?

A. The NRC's extensive regulatory review and requirements after the Fukushima Dai-ichi accident disrupted the NRC license review sequencing and added a few important issues to be considered in DE Carolinas' COLA. As necessary and required for a safety agency, the NRC was ensuring that all issues potentially related to the Fukushima accident and external events in general were thoroughly reviewed, and operating plants were clearly the priority.

Delays in new reactor licensing were inevitable. The actions specifically required by the NRC for the Lee Nuclear Project, in accordance with the Fukushima Near-Term Task Force recommendations, were dealt with during the COLA review and incorporated into the license conditions, including: 1) specific actions associated with the agency's post-Fukushima requirements for mitigation strategies and spent fuel instrumentation; and 2) a pre-startup schedule for post-Fukushima aspects of the new reactors' emergency preparedness and procedures. These additions and the review of the operating fleet also contributed to the delay of the issuance of the Lee COL.

D. <u>The Delay Related to Seismic Source Characterization</u>

Q. PLEASE EXPLAIN THE NEW SEISMIC SOURCE CHARACTERIZATION.

A. By 2009, the NRC was actively reviewing the seismic models for the Central and Eastern United States ("CEUS") Seismic Source Characterization for Nuclear Facilities based on the known facts that ground motion effects could be better characterized than in earlier NRC rules. After determining the best methods to use, probabilistic assessments were incorporated into the models. The NRC defined the CEUS project as follows: "The objective of the CEUS SSC Project is to develop a new seismic source model for the CEUS using a Senior Seismic Hazard Analysis Committee (SSHAC) Level 3 assessment process. The goal of the SSHAC process is to represent the center, body, and range of technically defensible interpretations of the available data, models,

and methods. Input to a probabilistic seismic hazard analysis (PSHA) consists of both seismic source characterization and ground motion characterization."

Q. WHAT IMPACT DID THE NEW SEISMIC SOURCE CHARACTERIZATION HAVE ON THE LICENSING OF THE LEE NUCLEAR PROJECT?

A. The new NUREG-2115 "Central and Eastern United States Seismic Source Characterization for Nuclear Facilities" was published in January 2012 and was incorporated into the DE Carolinas' license application for the Lee Nuclear Project. It was another new issue to address in DE Carolinas' COLA, and licensing delays were incurred.

Q. WHAT COMMON IMPACT DID THE YUCCA MOUNTAIN LICENSING REVIEW, THE REMANDED WASTE CONFIDENCE RULE, THE FUKUSHIMA DAI-ICHI ACCIDENT, AND THE CEUS SEISMIC SOURCE HAVE ON THE LEE NUCLEAR PROJECT?

A. Besides the above-described individual impacts from each one of these occurrences, there is a significant cumulative and not well-quantified effect on all the pending new reactor licenses. The NRC staffing and contractors work was more affected in a common area: environmental, siting, geologic and seismic reviews. Substitutions of experienced NRC staff or contractors assigned to a project were not conducive to efficient reviews when considering the sequencing and coordination of the licensing review steps necessary to arrive at Final Safety Evaluation Reviews (FSERs), Final Environmental Impact Statements, Final Safety Analysis Reports (FSARs),

Advisory Committee on Reactor Safeguards (ACRS) reviews with No Open Items, and, finally, to the conduct of hearings and NRC Commission Approval.

E. <u>Delays Related to Changes in Design Certification and Reference Plant</u>

Q. PLEASE EXPLAIN THE IMPACT OF THE AP1000 DESIGN CERTIFICATION AMENDMENT ON DE CAROLINAS' COLA REVIEW.

A. When DE Carolinas' COLA was docketed in 2008, it referenced the latest DCD for the AP1000 Design Certification, Revision 16 ("Rev 16"). In December 2011, about four years after DE Carolinas' COLA submittal, Westinghouse obtained approval for the "final" upgrade of its design certification, docketed as Revision 19 ("Rev 19") to the DCD. It was suggested by the NRC that utilities referencing Rev 16 could benefit by changing its COLA to reference Rev 19 of the AP1000 DCD; the Design-Centered Review Approach group would be able to maintain a common DCD for their applications review. DE Carolinas changed its COLA to reference Rev 19 of the AP1000 by submitting Revision 4 of the COLA on 7/29/2011. It should be remarked that the COLA must also describe the Inspections, Tests, Analyses, and Acceptance Criteria ("ITAAC") that are necessary to ensure that the plant has been properly constructed and will operate safely. When the application references a standard design certification, the applicant must perform the ITAAC for the certified design and the site-specific design features. Any changes must be reflected in the ITAACs. The change to DCD

Rev 19 required modification of DE Carolinas' COLA, including ITAACs, necessitating subsequent adjustments, NRC questions, and NRC interactions. The challenges with the design certification amendment and the external factors discussed above occurred generally between 2010 and 2015, which was the most critical period for advancing the NRC's review of the Lee COL application, and directly resulted in the delay of the NRC's issuance of the Lee COL.

F. DE Carolinas' Improvements to the COLA

Q. PLEASE PROVIDE SOME ADDITIONAL DETAIL ABOUT DE CAROLINAS' DECISION TO CHANGE THE LOCATION OF THE REACTOR.

A. DE Carolinas determined that the Lee nuclear reactor would be better anchored at a different location than the one initially selected for the COLA. My review of the Company's decision to change the location of the reactor indicates that this decision was a cost-effective change that would result in improved reactor building stability and more economic construction. However, a change to the COLA was necessary. Any COLA change requires preparation, review, and additional time.

Q. WHAT WERE THE BENEFITS OF THIS DECISION?

A. The benefits of this decision are first found in the NRC staff review of the Part 100 - Reactor Site Criteria, minimizing challenges by the staff and promoting efficiencies in the review. Also, it is significantly beneficial for the determination of the reactor site excavation, concrete foundation, and

placement of other buildings. It would pay off in the cost of the plant construction.

Q. WHAT ARE YOUR CONCLUSIONS WITH RESPECT TO DE CAROLINAS' DECISION?

A. It was reasonable and prudent for the reasons discussed above.

Q. PLEASE EXPLAIN DE CAROLINAS' DECISION WITH RESPECT TO ADDING A MAKE-UP POND.

A. DE Carolinas' decision to add a make-up pond for cooling water to the Lee Nuclear Project was based on the limited amount of water in the Ninety-Nine Islands Reservoir, the main cooling water source for the plant. The limitation was made evident during the drought of 2007-2008. The make-up pond, not a safety-related system, was deemed appropriate to maintain the plant's rated power and avoid interfering with the operations of dams and the water supplies of adjacent communities.

Q. WHAT ARE YOUR CONCLUSIONS WITH RESPECT TO DE CAROLINAS' DECISION?

A. It was a reasonable and prudent decision considering the circumstances established by the above-discussed issues emphasizing availability of water for plant cooling, dams, and town consumption during droughts.

Q. PLEASE PROVIDE SOME ADDITIONAL DETAIL ABOUT DE CAROLINAS' DECISION TO CHANGE THE COOLING TOWERS.

A. In December 2011, DE Carolinas decided to submit an amendment to the COLA revising the cooling tower design for the Lee Nuclear Project. After an

optimization study and alignment of the design to the Summer units' cooling towers, DE Carolinas changed the cooling water supply to the Component Cooling Water System ("CCWS") design from three to two cooling towers per unit to improve the basins, site flooding resistance, as well as to improve the overall reliability of the CCWS. These changes were responsive to an NRC Request for Additional Information ("RAI").

Q. WHAT ARE YOUR CONCLUSIONS WITH RESPECT TO DE CAROLINAS' DECISION TO CHANGE THE COOLING TOWERS?

A. It was a reasonable and prudent decision to improve the project design, the site characterization, as well as to provide appropriate response to the NRC in the post-Fukushima flooding concerns arena.

G. <u>Overcoming the Challenges of Part 52</u>

Q. WHAT EFFECT DID THE USE OF PART 52 HAVE ON THE LEE NUCLEAR PROJECT?

A. The use of Part 52 licensing has proven to be difficult for DE Carolinas and the other applicants seeking a COL referencing a Design Certification. It has also proven difficult at the construction stage, as evidenced by the projects at Vogtle and Summer. Moving from Part 50 to Part 52 introduced many new processes and strict control for departures from the Design Certification. Conformance with the DCD of the certified design and the COL finality requires meeting codes and standards prior to issuance, among other rigid processes. Changes have been controlled by conservative NRC Staff interpretations on some DCD documents that were not well defined.

Specifically, all design-related information in the so-called Tier 1 of the DCD is well-controlled since it is established by rulemaking and can only be changed by rulemaking. However, the design-related information contained in Tier 2 of the DCD, which supports the Tier 1 information, is approved but not certified by rulemaking. Changes to and departures from Tier 2 are strictly governed by Appendix D to Part 52, Section VIII. Furthermore, a part of Tier 2, designated as Tier 2*, is treated separately and was supposed to provide flexibility to applicants to make changes by using license amendments. In this way, changes to important design methodologies and improvements in technology could be accommodated but would be subject to review. At the beginning, three or four such areas of improvements were believed to be in the scope of Tier 2* design-related information. Eventually, twenty-four such areas were designated AP1000 Tier 2*. Change processes have been therefore cumbersome and time consuming, adding to the licensing delays. I believe that the licensing process established by Part 52 is the best option for licensing a nuclear power plant, but it needs improvements for better implementation while maintaining the public health and safety, protecting the environment, and the common defense and security. Moreover, implementation of Part 52 has been difficult for the lead plants, especially with regard to the completion of the detailed design. This issue is one of the most important to resolve for new nuclear plants in the US and abroad.

Q. PLEASE PROVIDE AN EXPLANATION OF DE CAROLINAS' MANAGEMENT OF RAIS AND GENERIC DESIGN CERTIFICATION ISSUES.

A. It is common to encounter a significant amount of additional and often unexpected work when responding to RAIs from the NRC. For the Lee Nuclear Project COLA review, this process was more arduous because the implementation of Part 52 was still developing and other issues, such as the Waste Confidence Rule and the Fukushima Daiichi accident, required the attention of the NRC Commission and Staff. Also, there were errors and changes to the AP1000 DCD and ongoing refinement or changes to seismic and geologic, instrumentation and control, control room, and emergency planning, as well as other emerging issues. AP1000 generic issues were being resolved after the Design Certification, and these standardization and finality reviews and changes took additional time. The changeover from Rev 16 to Rev 19 was not complicated, but it also took additional time, as did the seismic re-analysis resulting from NUREG-2115.

Q. PLEASE CITE ANOTHER SPECIFIC ISSUE WITH THE AP1000 DCD THAT IMPACTED THE DE CAROLINAS COL ISSUANCE.

A. Late in its review of DE Carolinas' COLA, in September 2014, the NRC notified the Lee Nuclear Project reference plant (Levy Nuclear Plant) of design errors in Westinghouse's DCD Rev 19. These errors tripped the thresholds established in Interim Staff Guidance ("ISG-11"), which clarifies the NRC staff's position regarding the finalization of licensing basis

information for COL applicants. The above-referenced issues included handling of combustible gas controls, main control room ("MCR") heat-up, habitability, dose responses and condensate return. This ISG-11 issue involved all COL applicants in the Design Review Group, and it took a year to receive clarification from the NRC to address how COL applicants could best resolve generic errors in certified designs. The complexity of the issues and the constraints from "design finality" required a major effort by Lee Nuclear Project licensing management to address and eventually endorse the reference plant's gas control, habitability, flux doubling, MCR dose, and condensate return responses to the NRC. The effort was completed in February 2016, some seventeen months after the issue was identified.

Q. HOW EXTENSIVE AN EFFORT WAS REQUIRED FOR DE CAROLINAS TO RESPOND TO RAIS REGARDING THE LEE NUCLEAR PROJECT?

A. As discussed above, the effort was extensive, continuous, and time-consuming.

Q. WHAT ARE YOUR CONCLUSIONS WITH RESPECT TO DE CAROLINAS' MANAGEMENT OF THESE ISSUES?

A. DE Carolinas' management of these issues was reasonable and prudent. DE Carolinas' approach was consistent with effective practices to respond to NRC inquiries as needed for the NRC to complete its review.

Q. WERE THERE OTHER ISSUES THAT MAY HAVE CONTRIBUTED TO THE TIME REQUIRED TO OBTAIN A COL FOR THE LEE NUCLEAR PROJECT?

A. I am certain that the issues discussed above are a representative sample of the many challenges encountered by DE Carolinas in the resolution of issues required to obtain a COL from the NRC. Other issues, whose impact are not well characterized, occurred during the NRC review process in the period under consideration, to include turnover at the Commission level and senior NRC staff. Also, other agencies have corresponding or specific responsibilities with respect to plans for nuclear plant construction. For instance, the U.S. Army Corps of Engineers (USACE), the U.S. Environmental Protection Agency (EPA), the U.S. Forest Service, the South Carolina Department of Health and Environmental Control, and other local agencies had their own set of permit issues. In summary, it would be demanding to license a power reactor under normal circumstances. The period 2008-2016 was not normal, as explained in detail above. Consequently, the issuance of the Lee Nuclear Project COL was delayed well beyond original expectations.

Q. COULD THE WASTE CONFIDENCE RULE, FUKUSHIMA, CEUS, WESTINGHOUSE DESIGN CHANGES, AND PART 52 ISSUES HAVE BEEN PREDICTED BEFOREHAND TO DELAY THE RECEIPT OF THE LICENSE BY FOUR TO FIVE YEARS?

A. No.

VI. REVIEW OF DE CAROLINAS COL AND PROJECT-RELATED DECISIONS AND COSTS

Q. HAVE YOU REVIEWED THE COST BREAKDOWN FOR THE COL AND PROJECT-RELATED COSTS THAT DE CAROLINAS IS SEEKING APPROVAL TO RECOVER?

A. Yes. I have reviewed summary information provided by DE Carolinas for different time periods of the project, including filings for cost recovery with the North Carolina Utilities Commission and the PSCSC. It is my understanding that DE Carolinas is seeking to recover approximately $518 million for the entire licensing project, which includes $270 million for project expenses and $248 million for AFUDC. FP&L has reported expenditures to the FPSC of $267 million for the site selection and pre-construction (exclusive of financing charges) as of December 31, 2017. The $270 million for site and pre-construction costs, including COL maintenance costs, incurred by DE Carolinas in this case compares well to the amount of cost incurred by FP&L for similar work conducted for Turkey Point Units 6 and 7.

Q. WHAT WOULD HAVE BEEN THE DISADVANTAGES OF SUSPENDING EFFORTS TO LICENSE THE LEE NUCLEAR PROJECT AND RESTARTING THIS EFFORT AT A SUBSEQUENT TIME?

A. The disadvantages include the difficulty and cost related to suspending the COLA, the effort and cost of re-starting it when potentially facing changes to the overall regulatory framework, and losing a dedicated expert management

and staff group at the NRC cognizant of the Lee Nuclear Project. Moreover, the main disadvantage would be not having a readily-executable license to construct and operate the Lee Nuclear Project at the time most favorable for DE Carolinas customers.

Q. WHAT IS THE VALUE TO DE CAROLINAS OF HAVING A COL FOR THE LEE NUCLEAR PROJECT?

A. The value of DE Carolinas' COL includes its intrinsic importance in the capability of deploying a nuclear power plant when most beneficial for a licensed life of forty years, with the possibility of additional license renewals. The COL is a readily available asset for DE Carolinas. It includes a very valuable, environmentally-screened tract of land and cooling water, quite suitable for large power generation.

Q. PLEASE PROVIDE SOME ADDITIONAL DETAILS ABOUT WHY THE LEE NUCLEAR PROJECT REMAINS VALUABLE.

A. The value of the Lee Nuclear Project derives primarily from two substantive assets: the Lee COL issued by the NRC and the availability of an environmentally suitable site, with the requirements for large power generation, already studied and approved.

Q. WHY DOES THE LEE COL REMAIN A VALUABLE ASSET?

A. The Lee COL enables DE Carolinas to build two AP1000 units on the Lee Nuclear Project site if DE Carolinas chooses to do so. As I explain in more detail above, the value of a COL for the construction and operation of an advanced passive safety nuclear power reactor lies in its durability, finality,

and capability to be executed when the licensee determines it is in the best interest of its customers.

Q. PLEASE PROVIDE SOME ADDITIONAL DETAIL ABOUT HOW PART 52 LIMITS REGULATORY CHANGES TO THE LEE COL.

A. The finality of the COL is strictly established by 10 C.F.R. § 52.98, especially at § 52.98 (a): "After issuance of a combined license, the Commission may not modify, add, or delete any term or condition of the combined license, the design of the facility, the inspections, tests, analyses, and acceptance criteria contained in the license which are not derived from a referenced standard design certification or manufacturing license, except in accordance with the provisions of § 52.103 or § 50.109 of this chapter, as applicable." Moreover, the issues that are resolved in a standard design certification ruling are also subjected to a very strict change process, and the NRC can only modify a certified design under very limited circumstances, such as if the NRC finds that the design does not meet the applicable regulations in effect at the time of the Design Certification, or if it is necessary to modify the design to assure adequate protection of the public health and safety, as established in 10 C.F.R. § 52.63. Even if the Design Certification changes or expires, DE Carolinas can select to construct and operate the Lee Nuclear Project as licensed as of December 19, 2016, including specified license conditions and accepted recommendations. The capability to construct and operate as licensed is a key feature and advantage of the finality rules of 10 C.F.R. Part 52. In this regard, it is notable that the Tennessee Valley Authority ("TVA") received a 1973

construction permit under 10 C.F.R. Part 50 for Watts Bar Unit 2, stopped construction in 1985, and reinitiated construction in 2007 under an extended construction permit. The NRC issued TVA a 10 C.F.R. Part 50 operating license for Watts Bar Unit 2 in 2015, and Watts Bar Unit 2 is currently in service. The Lee COL, which was issued pursuant to 10 C.F.R. Part 52, provides greater certainty with respect to the finality and capabilities of the license than was afforded to TVA under its 10 C.F.R. Part 50 construction permit.

Q. WHAT ARE THE BENEFITS OF HAVING THE LEE NUCLEAR PROJECT AS AN ENVIRONMENTALLY-SCREENED SITE?

A. The value of the Lee Nuclear Project as an environmentally-screened site is that the site has been rigorously examined and determined to be suitable to sustain a nuclear power plant. This determination includes the site's geology / hydrology / seismology / meteorology characteristics, population density and nearby man-made infrastructures, access roads and land improvements, and the valuable cooling water in compliance with national and regional use requirements. These determinations are supported by the record of decisions compiled over a decade of work.

Q. HOW DO THESE FACTORS MAKE THE LEE NUCLEAR PROJECT VALUABLE?

A. Having completed the significant technical effort that was required to characterize the site and obtain many of the regulatory approvals that are required to build and operate a nuclear power plant on the site, DE Carolinas

now has the option to execute the Lee Nuclear Project if and when the time is right. This factor makes the Lee Nuclear Project an asset of considerable value to DE Carolinas' customers.

Q. WHAT ARE THE ADVANTAGES OF THE LICENSING-FIRST APPROACH TAKEN BY DE CAROLINAS?

A. The advantages of the licensing-first approach taken by DE Carolinas rest on the capability for DE Carolinas' management to review the costs and risks of the Lee Nuclear Project as the design develops to ensure the viability of initiating nuclear construction, while proceeding at a pace where DE Carolinas could benefit from the lessons learned of other utilities also pursuing new nuclear generation. More importantly, DE Carolinas customers will have the advantage of having a license that will reduce significantly the lead time necessary to build and construct a future nuclear unit if there is a decision to go forward with the construction of a nuclear facility in the future.

Q. WAS THE SELECTION OF THE AP1000 DESIGN REASONABLE, WHEN CONSIDERING THE PROBLEMS ULTIMATELY ENCOUNTERED WITH THE LICENSING AND THE CONSTRUCTION OF AP1000 REACTORS?

A. Yes. The AP1000 design was and I believe continues to be the best reactor technology available, with the most advanced safety features and potential for economic deployment. Most of the proximate causes of rising cost and construction delays associated with new nuclear builds in the United States are attributable to the thirty-year hiatus in U.S. nuclear construction, not the

novelty of the AP1000 design. The significant problems with the Vogtle and Summer units are construction problems, beginning with the lack of extensive detailed design prior to and after construction startup, the introduction of modular construction, the construction management organization, the scheduling, the labor force, the supply chain, and changes thereto. These issues would be addressed prior to a decision to construct and operate by any of the utilities holding COLs that have not yet undertaken construction. DE Carolinas customers have been protected from potential cost overruns and delays from moving first in a restarted industry like new nuclear construction. However, by having a COL, DE Carolinas is still in a position to pursue new nuclear if and when it becomes appropriate to do so for its customers.

Q. WHAT IS THE NEAR-TERM IMPACT OF THE WESTINGHOUSE BANKRUPTCY, DISCONTINUATION OF CONSTRUCTION WORK, AND THE FINANCIAL ISSUES WITH THE SOUTH CAROLINA AND GEORGIA POWER PLANTS?

A. The impact of the above issues during most of 2017 were disruptive for the South Carolina and Georgia plants' construction, as well as increasing uncertainty and risk for other near-term nuclear plant construction. With Westinghouse's bankruptcy and its exiting the construction business, it became critical to re-evaluate project execution strategies for new nuclear and how engineering, procurement and construction would be undertaken to adhere to a reliable cost and schedule.

The construction of the South Carolina (SCE&G and Santee Cooper) nuclear power plant stopped shortly after the Westinghouse announcements. In July 2017, SCE&G and Santee Cooper announced that they would abandon the V.C. Summer Units 2 and 3 project. In December 2017, SCE&G applied to the NRC to suspend the COL licenses for VC Summer Units 2 & 3.

On the other hand, with many difficulties, the construction of the Vogtle Nuclear Power Plant ("NPP") is continuing with support from the federal government and approval in December 2017 by the Georgia Public Service Commission. The Vogtle NPP will receive federal production tax credits after it achieves commercial operation. Furthermore, a conditional commitment for additional loan guarantees from the Department of Energy would add $3.7 Billion to the companies supporting the construction: $1.67 Billion for Georgia Power, $1.6 Billion for Oglethorpe Power Corp., and $415 Million for the Municipal Electric Authority of Georgia for the construction of the two reactors. Construction has continued at Vogtle, with over 6,000 workers presently at the plant, with completion expected for Vogtle Units 3 and 4 by 2021 and 2022 respectively.

In the international arena, Westinghouse's AP1000 nuclear reactors in China are achieving significant milestones. Sanmen Unit 1 was connected to the electrical grid on June 30, 2018, and entered commercial operation on September 21, 2018. In addition, Sanmen Unit 2 was connected to the grid in August and is expected to enter commercial operation before the end of 2018. The other two AP1000 units in Haijang are also achieving operational

milestones, with Haijang 1 already connected to the grid and expected to be in commercial operation by December 2018. Haijang 2 is expected to be in commercial operation before mid-year 2019.

It is important to note that the acquisition of Westinghouse by Brookfield Business Partners LP's has been finalized and Westinghouse has exited bankruptcy. These developments are very important news for existing Westinghouse customers and their nuclear businesses, as Westinghouse is still the largest provider of nuclear services in the world.

Furthermore, the U.S. Department of Energy is strongly supporting the sale of six nuclear units by Westinghouse to India, and federal efforts continue to support the important role of nuclear power for the USA security, stability, contribution to amelioration of carbon releases, and long-time economics.

Q. WHAT MUST DE CAROLINAS DO TO MAINTAIN THE COL FOLLOWING ITS ISSUANCE?

A. DE Carolinas must conduct those activities necessary to ensure the issued COL continues to be protective of the safety and health of the public, the environment, and the common defense and security in a manner consistent with NRC regulations. The COL is valid for forty years from the date the Commission finds the acceptance criteria were met under 10 CFR § 52.103(g). Presently, the COL can be renewed for an additional twenty years, following a well-established process. The maintenance efforts and costs are minimal until the decision to proceed with the construction is made. Additional revisions and costs could be incurred if the NRC determines that a

safety issue needs to be reviewed and incorporated into the license, but these costs would not expected to be significant since they would likely be covered under a Design Certification Amendment.

VII. CONCLUSIONS

Q. BASED ON YOUR REVIEW OF THE LEE COLA PROCESS, INCLUDING DELAYS, AND WITH CONSIDERATION OF ALL IMPORTANT FACTORS AFFECTING THE REVIEW SCHEDULE, WERE THE DE CAROLINAS DECISIONS AND ACTIONS REASONABLE?

A. Yes. Based on my experience, a review of DE Carolinas' decisions and actions leads me to conclude that the stepwise approach to licensing and managing the project for the Lee Nuclear Project, and its decision to extend their target operation dates, are reasonable and consistent with industry best practices. Decisions were made to conduct necessary activities and to defer others, in accordance with the primary decision to obtain a license. For example, DE Carolinas made conscious decisions to defer certain long-lead procurement decisions and did not enter into an Engineering, Procurement, and Construction contract for the project. By choosing to reserve these expenditures until a later time, DE Carolinas showed sound risk management and will be able to make these decisions with the appropriate information in the future. It has preserved the option for future nuclear generation for its customers, with a license that can be exercised when the energy and economic conditions are favorable for base-loaded nuclear electricity generation.

Q. PLEASE PROVIDE YOUR OVERALL CONCLUSION OF THE PROJECT COSTS INCURRED FOR THE LEE NUCLEAR PROJECT.

A. I find that the project costs incurred for the Lee Nuclear Project are reasonable and prudent. The elevated AFUDC costs are due to the protracted proceedings to obtain the COL license; the multiple causes for the delay are well justified in the preceding discussions. I believe that DE Carolinas took technically and financially sound steps to enable the licensing and project activities for the Lee Nuclear Project.

Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes.

Exhibit NJD-1

Summary Resume of Nils J. Diaz, PhD

Dr. Nils J. Diaz is the Managing Director of The ND2 Group, an expert and policy advisor group with a strong focus on the national and international nuclear power development and deployment arena, and the Chief Strategic Officer of Blue Castle Holdings, Inc., an energy development corporation. He served as Commissioner, Florida Energy and Climate Commission, October 2008-October 2010.

Nils Diaz is a past Chairman of the U.S. Nuclear Regulatory Commission (NRC). Dr. Diaz was designated Chairman of the NRC by President Bush on April 1, 2003 and he served as such until his retirement from government service on June 30, 2006. As Chairman of the NRC, Dr. Diaz served as the principal executive officer of and the official spokesman for the NRC, and was responsible for the initiation and ultimate execution of the Agency's budget, and Congressional and international relations. Dr. Diaz was a Commissioner of the U.S. NRC for two consecutive 5-year Senate – confirmed appointments, including his years as Chairman of the Commission, beginning in 1996. As a member of the Commission, Dr. Diaz had responsibility for setting policy and rulemaking direction for the broad and diverse activities within the Commission's charter, including nuclear power reactors and nuclear fuel facilities, medical and industrial uses of radioisotopes, disposition of high-level and other radioactive wastes.

Prior to his appointment to the NRC, Dr. Diaz was the Director (1985-1996) of a national consortium for advanced nuclear power and propulsion (INSPI) for the Ballistic Missile Defense Organization (BMDO), Department of Defense, and Professor of Nuclear Engineering Sciences at the University of Florida (1969-1996). As a Director for BMDO, he exercised prime contractor management and Lead Scientist responsibilities for a diverse group of industries (including Aerojet, Boeing, Pratt & Whitney, Hughes Electronics, Rocketdyne and SRI), several national laboratories (including Los Alamos NL, Sandia NL, and Lawrence Livermore NL) and seven major universities, under contracts with the Department of Defense, the Defense Nuclear Agency, the Department of Energy and NASA. Dr. Diaz spent the majority of his academic service at the University of Florida, and was made Full Professor and Director in 1979. He holds multiple patents with the University of Florida and presently holds the rank of Professor Emeritus at the University of Florida. In 2005, he was awarded the University of Florida Distinguished Alumnus Award.

Dr. Diaz has held senior positions at several national advisory boards, and consulted for the U.S. Government, other governments, and major nuclear vendors and architect/engineers. He has owned or co-owned eight small corporations serving nuclear power and advanced information technology areas, and spent six years at nuclear utilities and reactor vendors resolving major technical and management performance issues.

Dr. Diaz is internationally recognized for his broad expertise and contributions to nuclear sciences, reactor systems and fuels, to the regulation of nuclear facilities and radioactive materials, to the development of nuclear policy and deployment infrastructure. He has worked extensively in nuclear policy development in both the national and international arena, including interacting and contributing to major nuclear deployment policy, forums and decision-making efforts focusing on energy infrastructure development. From 1969 to 1996, and from 2006 to 2017, Dr. Diaz held senior positions at several national advisory boards, and consulted for the U.S. Government, other governments, and major nuclear vendors and architect/engineers on civilian nuclear energy deployment.

Dr. Diaz holds a Ph.D. and M.S. in Nuclear Engineering Sciences from the University of Florida, and a B.S. Degree in Mechanical Engineering from the University of Villanova, Havana. He was licensed as a Senior Reactor Operator by the NRC and has formal training and practice in health physics, radiological sciences and nuclear medicine. He is a Fellow of the American Nuclear Society, the American Society of Mechanical Engineers, and the American Association for the Advancement of Sciences. He recently chaired the ASME Presidential Task Force in response to the Fukushima accidents. He has been recognized worldwide for his statesmanship on nuclear affairs, including chairing the G8Nuclear Summit in Russia and leading the US Delegation to the International Atomic Energy Agency General Conference in 2005. He has received many national and international awards, including the Henry DeWolf Smyth 2008 Nuclear Statesman Award, awarded by the Nuclear Energy Institute, representing the nuclear industry, and by the American Nuclear Society. Dr. Diaz has been elected a Member of the Hispanic Hall of Fame and recognized as one of the top 50 Hispanics in Sciences and Engineering, and was named the National Hispanic Scientist of the Year for 2009.

October 2018

Expected New Nuclear Power Plant Applications Updated September 4, 2008						
Company*	**Date of Application**	**Design**	**Date Accepted**	**Site Under Consideration**	**State**	**Existing Operating Plant**
Calendar Year (CY) 2007 Applications						
NRG Energy (52-012/013)	09/20/2007	ABWR	11/29/2007	South Texas Project (2 units)	TX	Y
NuStart Energy (52-014/015)	10/30/2007	AP1000	01/18/2008	Bellefonte (2 units)	AL	N
UNISTAR (52-016)	07/13/2007 (Envir.) 03/13/2008 (Safety)	EPR	01/25/2008	Calvert Cliffs (1 unit)	MD	Y
Dominion (52-017)	11/27/2007	ESBWR	01/28/2008	North Anna (1 unit)	VA	Y
Duke (52-018/019)	12/13/2007	AP1000	02/25/2008	William Lee Nuclear Station (2 units)	SC	N
2007 TOTAL NUMBER OF APPLICATIONS = 5 TOTAL NUMBER OF UNITS = 8						
Calendar Year (CY) 2008 Applications						
Progress Energy (52-022/023)	02/19/2008	AP1000	04/17/2008	Harris (2 units)	NC	Y
NuStart Energy (52-024)	02/27/2008	ESBWR	04/17/2008	Grand Gulf (1 units)	MS	Y
Southern Nuclear Operating Co. (52-025/026)	03/31/2008	AP1000	05/30/2008	Vogtle (2 units)	GA	Y
South Carolina Electric & Gas (52-027/028)	03/31/2008	AP1000	07/31/2008	Summer (2 units)	SC	Y
AmerenUE (750)	07/24/2008	EPR		Callaway (1 unit)	MO	Y
Progress Energy (756)	07/30/2008	AP1000		Levy County (2 units)	FL	N
Exelon (761)	09/03/2008	ESWBR		Victoria County (2 units)	TX	N
Entergy (745)		ESBWR		River Bend (1 unit)	LA	Y
PPL Generation (762)		EPR		Bell Bend (1 unit)	PA	Y
UNISTAR (759)		EPR		Nine Mile Point (1 unit)	NY	Y
Luminant Power (754)		USAPWR		Comanche Peak (2 units)	TX	Y
Detroit Edison (757)		ESBWR		Fermi (1 unit)	MI	Y
Alternate Energy Holdings (765)		EPR		Bruneau (1 unit)	ID	N
2008 TOTAL NUMBER OF APPLICATIONS = 13 TOTAL NUMBER OF UNITS = 19						
Calendar Year (CY) 2009 Applications						
Florida Power and Light (763)		AP1000		Turkey Point (2 units)	FL	Y
Amarillo Power (752)		EPR		Vicinity of Amarillo (2 units)	TX	UNK
2009 TOTAL NUMBER OF APPLICATIONS = 2 TOTAL NUMBER OF UNITS = 4						
Calendar Year (CY) 2010 Applications						
Blue Castle Project		TBD		Utah	UT	N
Unannounced		TBD		TBD	TBD	UNK
Unannounced		TBD		TBD	TBD	UNK
2010 TOTAL NUMBER OF APPLICATIONS = 2 TOTAL NUMBER OF UNITS = 4						
2007 – 2010 Total Number of Applications = 23 Total Number of Units = 34						

*Project Numbers/Docket Numbers
Yellow – Acceptance Review Ongoing
Blue – Accepted/Docketed

U.S. NRC: COL Applications Received through April 25, 2018

Proposed New Reactor(s)	Design	Applicant	Status
Bell Bend Nuclear Power Plant	U.S. EPR	PPL Bell Bend, LLC	Withdrawn
Bellefonte Nuclear Station, Units 3 and 4	AP1000	Tennessee Valley Authority (TVA)	Withdrawn
Callaway Plant, Unit 2	U.S. EPR	AmerenUE	Withdrawn
Calvert Cliffs, Unit 3	U.S. EPR	Calvert Cliffs 3 Nuclear Project, LLC and UniStar Nuclear Operating Services, LLC	Withdrawn
Comanche Peak, Units 3 and 4	US-APWR	Luminant Generation Company, LLC (Luminant)	Suspended
Fermi, Unit 3	ESBWR	Detroit Edison Company	Issued
Grand Gulf, Unit 3	ESBWR	Entergy Operations, Inc. (EOI)	Withdrawn
Levy Nuclear Plant, Units 1 and 2	AP1000	Duke Energy Florida, LLC (DEF)	Issued
Nine Mile Point, Unit 3	U.S. EPR	Nine Mile Point 3 Nuclear Project, LLC and UniStar Nuclear Operating Services, LLC (UniStar)	Withdrawn
North Anna, Unit 3	ESBWR	Dominion Virginia Power (Dominion)	Issued
River Bend Station, Unit 3	ESBWR	Entergy Operations, Inc. (EOI)	Withdrawn
Shearon Harris, Units 2 and 3	AP1000	Progress Energy Carolinas, Inc. (PEC)	Suspended
South Texas Project, Units 3 and 4	ABWR	Nuclear Innovation North America, LLC (NINA)	Issued
Turkey Point, Units 6 and 7	AP1000	Florida Power and Light Company (FPL)	Issued
Victoria County Station, Units 1 and 2	ESBWR	Exelon Nuclear Texas Holdings, LLC (Exelon)	Withdrawn

U.S. NRC: COL Applications Received through April 25, 2018

Proposed New Reactor(s)	Design	Applicant	Status
Virgil C. Summer, Units 2 and 3	AP1000	South Carolina Electric & Gas (SCE&G)	Issued
Vogtle, Units 3 and 4	AP1000	Southern Nuclear Operating Company (SNC)	Issued
William States Lee III, Units 1 and 2	AP1000	Duke Energy	Issued

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